

Abstract of the Disclosure

Fractional Fourier transform properties of lenses or other optical environments are applied to one or more positive-definite optical transfer functions at locations outside the Fourier plane to realize or closely approximate arbitrary non-positive-definite transfer functions varying in both amplitude and phase. Controllable filter elements can be employed to create controllable optical processors which may be used for image filtering and optical computations using complex-valued arithmetic for monochromatic, color, and wide-spectrum optical signals. Applications include integrated optics, optical computing systems, particle beam systems, radiation accelerators, astronomical observation systems, and controllable lens systems.